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Sampling QA/QC Work Plan

County Line Mercury

Prepared By:

URS Operating Services, Inc.

ADMINISTRATIVE RECORD

U.S.EPA Project No.: 9605-0006
Contractor Project No.: 75-60506.00
U.S.EPA Contract No.: 68-W5-0031

FILE PLAN
2.21.01

Approvals

URS Operating Services, Inc.

7/26/96
Jennifer Blair — Date
START Project Leader

EPA

8/6/96
Peter Stevenson — Date
On-Scene Coordinator

Bill Fodor 7/26/96
Bill Fodor — Date
START Response/Prevention Preparedness Team Leader

Note: This Sampling QA/QC Work Plan was prepared using QASPER version 4.1 software to provide general guidelines for site specific sampling. A change in site conditions and/or direction from the EPA On-Scene Coordinator may require a departure from the plan. Departures from the plan will be noted in field log books and project reports.

1.0 SITE BACKGROUND

The site is located at the Bluffs Apartment Complex in Highlands Ranch, Douglas County, CO. It is a residential site. The site is estimated to cover less than one acre.

This plan will address the following units: buildings and drainage ditches.

The following types of materials were handled at the site: inorganics.

The contaminants of concern are:

Contaminant	Concentration Range
Mercury	

The suspected contamination is a result of: children playing with illegally disposed mercury.

The physical/chemical threat to the population at risk is: Mercury exposure.

The basis of the site information is a site visit.

The current stage/phase of the project is: Early Assessment.

2.0 DATA USE OBJECTIVES

The following data quality objectives will be applied to this project:

Program Area	Sampling Objective	Data Type
Site Assessment/ Removal	Threat to humans	Screening and Definitive

Jerome Mercury Vapor Analyzer real time instrumentation will be utilized for on-site determination of ambient mercury concentrations. Screening data criteria will be used. Additional air samples will be collected on Hopcalite Tubes and submitted for laboratory definitive data analysis of mercury concentrations.

Soil and sediment samples will be collected following UOS TSOPs. Sample analyses will follow definitive data criteria.

3.0 SAMPLING DESIGN

The following remedial units will be sampled as indicated.

Remedial Unit	Program Area/ Sampling Objective	Matrix	Parameter
drainage ditches	Site Assessment/Threat to humans	Soil	Mercury
buildings	Site Assessment/Threat to humans	Air	Mercury

Sampling Designs:

Drainage Ditches, Site Assessment/Threat to humans, Soil, Mercury

The Judgmental sampling approach will be implemented. Samples will be collected from the following locations and depths/areas: Soil/sediment samples will be taken in the culvert, at the culvert outfall, and next to Stairway #1.

Buildings, Site Assessment/Threat to humans, Air, Mercury

The One Time sampling approach will be implemented. Samples will be collected from the following locations and depths/areas: Air samples will be collected in the Weedon kitchen and the Rodriguez living room, parents' bedroom, and child's bedroom.

Table 1, Sampling Summary, identifies the number of field samples and QA/QC samples to be collected.

4.0 SAMPLING AND ANALYSIS

Table 2, Sampling Requirements Summary, contains information pertinent to sampling, such as the sample container types and the quantity to be collected at each sampling location, the preservation method to be used, and the sample holding times (based on the parameter being analyzed for and the matrix). For the air matrix, this table identifies the sample flow rate rather than sample containers and the volume to be collected rather than the preservative.

The following sampling equipment/media will be used to obtain environmental samples from the respective matrix:

Parameter/Matrix	Equipment/Media	Fabrication	Dedicated
Mercury/Soil	Scoop/bottle	plastic	Y
Mercury/Air	Hopcalite Tube	NA	Y

Table 3.1, Analytical Summary, contains the action levels, required detection limits, analytical method/instrument references, and the associated required data type designation.

5.0 STANDARD OPERATING PROCEDURES

5.1 Sampling SOPs

In addition to the UOS START Technical Standard Operating Procedures (TSOPs), the following QASPER sampling SOPs will be implemented for this project; These are typically applicable procedures which may be varied or changed as required, dependent upon site conditions or equipment limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final project deliverables.

General Field Sampling Guidelines

Sampling is the selection of a representative portion of a larger population, universe, or body. Through examination of a sample, the characteristics of the larger body from which the sample was

drawn can be inferred. In this manner, sampling can be a valuable tool for determining the presence, type, and extent of contamination by hazardous substances in the environment. The primary objective of all sampling activities is to characterize a waste site accurately so that its impact on human health and the environment can be properly evaluated. It is only through sampling and analysis that site hazards can be measured and the job of cleanup and restoration can be accomplished effectively with minimal risk. The sampling itself must be conducted so that every sample collected retains its original physical form and chemical composition.

In this way, sample integrity is ensured, quality assurance standards are maintained, and the sample can accurately represent the larger body of material under investigation.

The extent to which valid inferences can be drawn from a sample depends on the degree to which the sampling effort conforms to the project's objectives. For example, as few as one sample may produce adequate, technically valid data to address the project's objectives. Meeting the project's objectives requires thorough planning of sampling activities, and implementation of the most appropriate sampling and analytical procedures.

Sample Storage, Preservation, and Handling

Samples should be collected using equipment and procedures appropriate to the matrix, parameters and sampling objective. The volume of the sample collected must be sufficient to perform the analysis requested. Samples must be stored in the proper types of containers and preserved in a manner appropriate to the analysis to be performed. All samples must be cooled to 4C from the time of collection until analysis. When a preservative other than cooling is used, the preservative is generally added after the sample is collected, unless the sample container has been pre-preserved by the laboratory. If necessary, the pH must be adjusted to the appropriate level and checked with pH paper in a manner which will not contaminate the sample.

Quality Assurance/Quality Control Samples

QA samples are used as an assessment tool to determine if environmental data meet the quality criteria established for a specific application. QC samples are generally used to establish intralaboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. The goal of including QA/QC samples with any sampling or analytical event is to be able to identify, measure and control the sources of error that may be introduced from the time of sample bottle preparation through analysis.

Analytical results for these samples can be used to assess accuracy as well as cross contamination. Accuracy refers to the correctness of the concentration value and the qualitative certainty that the analyte is present. It is a combination of both bias (systematic error) and precision (random error). Bias is defined as the deviation of a measured value from a reference value or known spiked amount, and is determined by calculating percent recovery. Precision is a measure of the closeness of agreement among individual measurements. Precision is determined by coefficient of variation calculations.

Chip, Wipe, and Sweep Sampling

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit a specific sampling site. The sampling location

should be selected based upon the potential for contamination as a result of manufacturing processes or personnel practices.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device should be laboratory cleaned and wrapped in clean, autoclaved aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

Wipe samples are collected from smooth surfaces to indicate surficial contamination; a sample location is measured and marked off. While wearing a new pair of surgical gloves, open a sterile gauze pad and soak it with solvent. The type of solvent used is dependent on the surface being sampled. Stroke the pad firmly over the sample surface, first vertically, then horizontally, to ensure complete coverage. Then transfer the gauze pad to the proper sample container.

Sweep sampling is an effective method for the collection of dust or residue on porous or non-porous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, use a dedicated brush to sweep material into a dedicated dust pan. The sample is then transferred to the proper sample container.

Soil Sampling

Soil samples may be collected using a variety of methods and equipment. The methods and equipment used are dependent on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel,or scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

Sediment Sampling

Sediment samples may be collected using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile required (surface vs. subsurface), the type of sample required (disturbed vs. undisturbed), contaminants present, and sediment type.

Sediment is collected from beneath an aqueous layer either directly, using a hand held device such as a shovel, trowel, or auger; or indirectly, using a remotely activated device such as an Ekman or Ponar dredge. Following collection, sediment is transferred from the sampling device to a sample container of appropriate size and construction for the analyses requested. If composite sampling techniques are employed, multiple grabs are placed into a container constructed of inert material, homogenized, and transferred to sample containers appropriate for the analyses requested.

The homogenization procedure should not be used if sample analysis includes volatile organics; in this case, sediment, or multiple grabs of sediment, should be transferred directly from the sample collection device or homogenization container to the sample container.

Air Sampling for Metals (NIOSH Method 6009, Mercury)

Air sampling for elements (metals) involves passing a known quantity of air across two Hopcalite sorbent media tubes in train. Analytical results from the Hopcalite media tubes will be used as confirmation for the real-time Jerome 431-X Mercury Vapor Analyzer results.

5.2 Sample Documentation

All sample documents will be completed legibly and in ink. Any corrections or revisions will be made by lining through the original entry and initialling the change. The following sample documentation will be maintained:

Field Logbook

The field logbook is a descriptive notebook detailing site activities and observations so that an accurate, factual account of field procedures may be reconstructed. All entries will be signed by the individuals making them. Entries should include at least the following:

- site name and project number
- names of personnel on site
- dates and times of all entries
- descriptions of all site activities, including site entry
- noteworthy events and discussions
- weather conditions
- site observations
- identification and description of samples and locations
- subcontractor information and names of on-site personnel
- dates and times of sample collections and chain-of-custody information
- records of photographs
- site sketches

Sample Labels

Sample labels will be securely affixed to the sample container. They will clearly identify the particular sample, and should include the following information:

- site name and project number
- date and time the sample was collected
- sample preservation method
- analysis requested
- sampling location
- signature of samplers
- unique sample bottle ID number

Chain-of-Custody Record

A Chain-of-Custody Record will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for. The Chain-of-Custody Record should include at least the following information:

- sample identification (by name and by sample bottle ID number)
- sample location
- sample collection date
- sample information, i.e., matrix, number of bottles collected, etc.
- names and signatures of samplers
- signatures of all individuals who have had custody of the samples

When samples are not under direct control of the individual currently responsible for them, they will be stored in a locked container which has been sealed with a Custody Seal.

Custody Seal

Custody Seals demonstrate that a sample container has not been opened or tampered with. The individual who has custody of the samples will sign and date the seal and affix it to the container in such a manner that it cannot be opened without breaking the seal.

5.3 Sample Handling and Shipment

Each of the sample bottles will be sealed. Sample bottles will be labeled as described above. Sealed bottles will be placed in the appropriate transport containers. All sample documents will be affixed to the underside of each transport container lid. The lid will be sealed and custody seals will be affixed to the transport container. All samples will be hand delivered to the laboratory.

6.0 QUALITY ASSURANCE REQUIREMENTS

The following QA requirements will be implemented on this project:

Screening Data

Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantification, although the quantification may be relatively imprecise.

Definitive Data

Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For data to be definitive, either analytical or total measurement error must be determined.

Definitive Data QA/QC Elements

Sample documentation (location, date and time collected, batch, etc.)

Chain of custody (when appropriate)

Sampling design approach (systematic, simple or stratified random, judgmental, etc.)

Initial and continuing calibration

Determination and documentation of detection limits

Analyte(s) identification

Analyte(s) quantification

QC blanks (trip, method, rinsate)

Matrix spike recoveries

Performance Evaluation (PE) samples (when specified)

Analytical error determination (measures overall precision of analytical method): An appropriate number of replicate aliquots, as specified in this document, are taken from at least one thoroughly homogenized sample, the replicate aliquots are analyzed, and standard laboratory QC parameters (such as variance, mean, and coefficient of variation) are calculated and compared to performance requirements specified in this document.

Total measurement error determination (measures overall precision of measurement system, from sample acquisition through analysis): An appropriate number of collocated samples as determined in this document are independently collected from the same location and analyzed following standard operating procedures. Based on the analytical results, standard laboratory QC parameters such as variance, mean, and coefficient of variation should be calculated and compared to measurement error goals defined in this document. This procedure may be required for each matrix under investigation, and may be repeated for a given matrix at more than one location.

7.0 DATA VALIDATION

Data generated for this project will be validated as follows:

Screening Data

Screening data need only be evaluated for calibration and detection limits.

Definitive Data

This objective, requires that at least 10% of the samples in the lab data package be evaluated for all of the elements listed in Section 6.0 of this QA/QC Sampling Plan.Of the remaining samples, holding times, blank contamination, precision, accuracy, error determination,detection limits, and confirmed identification will be reviewed. This objective also requires review of all elements for all samples in each analyte category (i.e., VOAs and PCBs) in every tenth data package received from an individual lab.

The soil and wipe sample analytical results will be validated. However, the Hopcalite Tubes and Jerome 431-x Mercury Vapor Analyzer will be reviewed and evaluated.

8.0 DELIVERABLES

The URS Operating Services, Inc. Project Leader, Jennifer Blair, will maintain contact with the EPA On-Scene Coordinator, Peter Stevenson, to provide information regarding the technical and financial progress of the project. This communication will begin when the project is assigned. Activities under this project will be documented and reported in one or more of the deliverables described below.

Analytical Report

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, Chain-of-Custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Data Review

A review of the data generated under this plan will be undertaken. The assessment of data acceptability or useability will be provided separately, or as part of the Analytical Report.

Maps/Figures

9.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

9.1 Personnel Information

The EPA On-Scene Coordinator, Peter Stevenson, will provide overall direction to the URS Operating Services, Inc. staff concerning project objectives, sampling needs, and schedule.

The URS Operating Services, Inc. Task Leader/Manager, Jennifer Blair, is the primary point of contact with the EPA On-Scene Coordinator. The Project Leader is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks.

The URS Operating Services, Inc. Quality Assurance Officer Lori Raschke, or his/her designee, is responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Analytical Services Coordinator, Lori Raschke, is the primary contact with the analytical laboratory.

The following personnel will also work on this project:

Name	Responsibility
Jan Christner	Sampling/Air Monitoring/Document
Jennifer Blair	Sampling/Air Monitoring/Document
Lori Raschke	QC coordinator
Mark Rudolph	Sampling/Air Monitoring/Document
Peter Stevenson	EPA On-Scene Coordinator

9.2 Laboratory Information

The following laboratories will provide the following analyses:

Lab Name/Location	Lab Type	Parameters
ES & E Englewood, Colorado	Commercial	Mercury/Soil, Sediment, Wipe
Schuller International, Inc. Littleton, Colorado	Commercial	Mercury/Air

10.0 SCHEDULE OF ACTIVITIES

Proposed Schedule of Work

Activity	Start Date	End Date
Soil, Sediment and Wipe Sampling	05/05/96	05/16/96
Air Sampling	05/05/96	05/16/96

11.0 ATTACHMENTS

The following are attachments to this Sampling QA/QC Plan:

Target Analyte List - Inorganics

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Detection Limit (µg/L -- water (1))
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

(1) Sediment detection limit 100x water (µg/kg -- soil/sediment).

Based on the Contract Laboratory Program Statement of Work, ILMO2.1 (9/91).

Table 1. Field Sampling Summary

Remedial Unit: drainage ditches
Date: 05/16/96
Program Area: Site Assessment
Page: 1
Sampling Objective: Threat to humans

Matrix	Parameter	Backgrnd Samples	Screening Samples	Definitive Samples	Trip Blanks	Field Blanks	Rinsate Blanks	Matrix Spikes	PE Samples	Replicate Aliquots	Collocated Samples	Total Samples
Soil	Mercury	0	0	6	0	0	0	1	0	1(S), 1(C)	0	6
Wipe	Mercury	0	0	1	0	0	0	0	0	1(S)	0	1

Table 1. Field Sampling Summary - Air

Remedial Unit: buildings
Program Area: Site Assessment
Sampling Objective: Threat to humans

Date: 05/16/96
Page: 1

Matrix	Parameter	Backgrnd Samples	Screening Samples	Definitive Samples	Trip Blanks	Field Blanks	Lot Blanks	Collocated Samples	Break-through Samples	Sample Replicates	PE Samples	Total Samples
Air	Mercury	0	10	2	1	0	0	0	2	0	0	15

Table 2. Sampling Requirements Summary

Date: 05/16/96
Page: 1

Remedial Unit	Program Area/Sampling Objective	Matrix	Parameter	Sample Container (Number)	Sample Preservation	Sample Holding Time
drainage ditches	Site Assessment/Threat to humans	Soil	Mercury	plastic (1)	4°C	28 days
buildings	Site Assessment/Threat to humans	Wipe	Mercury	cotton (1)	4°C	28 days

Table 2. Sampling Requirements Summary - Air

Date: 05/16/96
Page: 1

Remedial Unit	Program Area/Sampling Objective	Matrix	Parameter	Flow Rate	Volume to be Collected	Sample Holding Time
buildings	Site Assessment/Threat to humans	Air	Mercury	0.15-0.25 1 L /min	(16-18 hrs) 960 - 1,080 Liters	30 days @ 25C

Table 3.1. Analytical Summary

Date: 05/16/96
Page: 1

Remedial Unit	Program Area/Sampling Objective	Matrix	Parameter	Action Level	Required Detection Limit	Analytical Method/ Instrument	Required Data Type
buildings	Site Assessment/Threat to humans	Air	Mercury	0.025 mg/m^3(s)	0.0003 mg/m^3	Jerome Mercury Vapor Analyzer	S
buildings	Site Assessment/Threat to humans	Air	Mercury	0.025 mg/m^3(D)	0.05 µg	Niosh Method 6009, Hopcalite Tubes	D
drainage ditches	Site Assessment/Threat to humans	Soil	Mercury	0(S), 0(D)	0.2 ppb	SLO 846, Method 7471/CVAA	D
buildings ditches	Site Assessment/Threat to humans	Wipe	Mercury	0.025 mg/m^3		SLO 846, Method 7471/CVAA	D